ABSTRACT

DISSERTATION TITLE: An assessment of the accuracy of analytical model planning in Orthognathic surgery.

BACKGROUND:

Orthognathic surgery is the art and science of diagnosis, treatment planning, and execution of treatment by combining orthodontics and oral and maxillofacial surgery to correct musculoskeletal, dento-osseous, and soft tissue deformities of the jaws and associated structures. In planning Orthognathic surgery for patients with severe dentofacial deformities and occlusal discrepancies, the feasibility of visualization of the final treatment outcome is very important. The Orthognathic approach is expected to lead to optimal functional, esthetic and stable results, thus satisfying the patient’s needs, not only regarding physical appearance but also self-confidence and esteem. In view of this, it is essential to accurately predict the result of a proposed treatment plan for proper understanding and communication between the patient, the orthodontist and the oral surgeon involved. Analytical model surgery allows the transfer of prescribed three-dimensional movements directly to the patient during the correction of complex dentofacial deformities. Published studies in which a splint is utilized to achieve the preferred horizontal or vertical movement of maxilla in the operating room, report a wide range of variation between the planned and actual outcome. Therefore the reliability of analytical model planning remains in question. The purpose of this study was to assess our method of analytical model planning to achieve the desired movement of maxilla.
MATERIALS AND METHODS:

Five patients (three males and two females) with dentofacial deformity, who reported to Rajas Dental College, were included in this prospective study. The patients were between the age group of 20-30 years. A power of 90% and P value was fixed at <0.05 to be statistically significant. A convenient sampling was done and sample size of five was arrived.

All study subjects underwent:

1. Preoperative and 5-week postoperative lateral cephalometric radiographs of acceptable quality with a metric reference frame for analysis

2. Consistent presurgical facial analysis by the surgeon, including millimeter decisions concerning planned horizontal and vertical repositioning, and reorientation (pitch, roll, yaw) of the maxilla

3. Consistent analytic model surgery planning with splint construction (intermediate if needed and final)

4. Use of the prefabricated splint to establish the maxillary positioning after Le Fort I osteotomy prior to plate and screw fixation

5. Use of consistent intraoperative landmarks to confirm vertical orientation (medial canthus to maxillary central incisor)

The difference between the pre and post-op horizontal and vertical position of central incisor is analyzed both cephalometrically and model surgery.
STATISTICAL ANALYSIS:

The data was analyzed using SPSS (software package for social sciences) version 20. Measures of central tendency E.g. Mean and Measures of Dispersion E.g. Standard deviation was calculated for all the parameters. To compare the mean difference between the different groups like planned and actual measurement and between pre and post-operative measurement paired sample student ‘t’ test was used. P value of 5% was considered significant.

RESULTS:

Analysis of the vertical movements of maxilla revealed, there was a difference of ≥1mm between the planned and actual obtained vertical movement of maxilla cephalometrically. In pre and post-op model surgery assessment also, there was a difference of ≥1mm between the planned and actual obtained vertical movement of maxilla. Paired t test was done to assess the difference in these parameters pre and post operatively. For vertical movements of maxilla, the mean difference between the planned and actual obtained movements of maxilla was not statistically significant cephalometrically (P›0.05). But the model surgery measurements showed statistically high significant difference between the planned and actual obtained movements of maxilla (P‹0.05). In case of horizontal movement, except in one case, the difference between the planned and actual obtained movement of maxilla was ≤ 1mm both cephalometrically and in model surgery. For horizontal movements of maxilla, the mean difference between the planned and actual obtained movements of maxilla was not statistically significant both cephalometrically and in model surgery (P›0.05).
SUMMARY AND CONCLUSION:

The results show that the internal reference points and external reference points used in our study method was unable to place the maxilla as planned in the vertical dimension.

In case of horizontal movements of maxilla, our method of face bow transfer and model surgery using Erickson model platform for splint fabrication was accurate in placing the maxilla as planned horizontally.

The position of the maxillary incisors is one of the most critical variables. Errors in the vertical position of the maxilla inevitably affect the final anteroposterior position of the maxillary-mandibular complex, because the mobilized jaw complex rotates about a condylar axis that is not well defined when mandibular autorotation exceeds a few millimeters. It appears that our positioning of is, in comparison, is within the range of most of the studies using extra oral points. It might be that the endeavor invested in the measuring procedure, be it intraoral or extra oral is more important than the method as such.

The environment and the number of surgeons involved in the surgery also significantly influence the precision of Orthognathic surgery.

To improve the surgical accuracy, we must strive to reduce the range of random variation by careful and rigorous treatment planning and model surgery, by exactly performed surgery according to the treatment plan, and by including double-checks of all intra operative measurements.

KEYWORDS: Analytical model planning, external reference point, internal reference point, Erickson model platform, Predictive tracing